

Comparison of Prenatal Attachment Levels in Smoking and Non-Smoking Pregnant Women

Sigara İçen ve İçmeyen Gebelerde Prenatal Bağlanma Düzeylerinin Karşılaştırılması

Zeynep Kartal¹ , Semra Kocataş² 

1. Kayseri Şehir Eğitim ve Araştırma Hastanesi, Kayseri
2. Sivas Cumhuriyet Üniversitesi, Sivas

Abstract

Objective: This study aimed to compare prenatal attachment levels between smoker and non-smoker pregnant women. **Method:** In this comparative-descriptive study, a total of 160 pregnant women (80 smokers-80 non-smokers), who were between 18-35 years of age, had their first pregnancy, were at or above 20 weeks of gestation, and had no chronic health problems or communication problems, among the pregnant women who applied to Family Health Centers for pregnancy follow-up. The data were collected using a Participant Screening Form, the Fagerstrom Test for Nicotine Dependence, Prenatal Attachment Inventory.

Results: Although there was no significant difference, it was determined that the attachment scores of non-smokers were higher than those of smokers. A negative correlation was found between nicotine addiction levels and mother-infant attachment levels of pregnant smokers. Bivariate logistic regression analysis revealed that the effect of smoking during pregnancy on prenatal mother-infant attachment (Odds Ratio=0.010; p=0.999) was insignificant.

Conclusion: Although the effect of smoking during pregnancy on prenatal attachment was insignificant, it was revealed that the nicotine addiction of pregnant women who smoked during pregnancy reduced prenatal attachment. Strengthening prenatal attachment may be a promising new approach to interventions for smoking cessation during pregnancy. At the same time, not smoking during pregnancy can strengthen prenatal attachment.

Keywords: Fetus, maternal-fetal relations, pregnancy, pregnant women, smoking

Öz

Amaç: Bu çalışma sigara içen ve içmeyen gebelerin prenatal bağlanma düzeylerinin karşılaştırılması amacıyla yapılmıştır. **Yöntem:** Karşılaştırmalı-tanımlayıcı tipte olan bu çalışmada, Aile Sağlığı Merkezlerine gebelik takibi için başvuran gebeler arasından 18-35 yaşları arasında, ilk gebeliğini yapmış, 20. gebelik haftası ve üzerinde olan, kronik sağlık sorunu ve iletişim sorunu olmayan toplam 160 gebe (80 sigara içen-80 sigara içmeyen) yer almıştır. Veriler, Katılımcı Tarama Formu, Fagerstrom Nikotin Bağımlılığı Testi, Doğum Öncesi Bağlanma Envanteri kullanılarak toplanmıştır.

Bulgular: Anlamlı bir fark olmamasına rağmen sigara içmeyenlerin bağlanma puanlarının sigara içenlere göre daha yüksek olduğu belirlenmiştir. Sigara içen gebelerin nikotin bağımlılık düzeyleri ile anne-bebek bağlanma düzeyleri arasında negatif korelasyon bulunmuştur. İki değişkenli lojistik regresyon analizi, gebelikte sigara içmenin doğum öncesi anne-bebek bağlanmasına etkisinin (Odds Ratio=0.010; p=0.999) istatistiksel olarak anlamlı olmadığını ortaya koymuştur.

Sonuç: Gebelikte sigara içmenin prenatal bağlanma üzerindeki etkisinin anlamlı olmadığı ancak olmakla gebelik süresince sigara içen gebelerin nikotin bağımlılığının, prenatal bağlanmayı azalttığı ortaya çıkmıştır. Doğum öncesi bağlanmanın güçlendirilmesi, gebelik sırasında sigarayı bırakmayı hedefleyen müdahaleler için umut verici yeni bir yaklaşım olabilir. Aynı zamanda gebelikte sigara içilmemesi de prenatal bağlanmayı güçlendirebilir.

Anahtar kelimeler: Fetüs, anne-fetal ilişkileri, gebelik, gebe kadınlar, sigara içme

Introduction

Prenatal attachment is "an emotional bond between parents and their unborn child" (1,2). It is known that strong mother-infant attachment has an encouraging effect on health-promoting habits such as not using harmful substances (e.g., cigarettes, alcohol), receiving prenatal care, eating healthy, and having enough sleep and exercising during pregnancy. It makes adaptation to motherhood easier (3). Prenatal attachment is the most important sign that this strong connection between the mother and the infant will be formed. For this reason, mothers turn towards healthy behaviors more frequently during their pregnancy (4). With the formation of the mental image of the baby and the increase in fetal movements at the beginning of the second trimester of pregnancy, the pregnant woman starts to think that her unborn child is developing a bond with her and sees the child as a separate entity (5). Situations like not sufficiently utilizing prenatal care services or not attending follow-ups on time, the case that the woman or her partner pays importance to the sex of the baby, previous pregnancy losses, unwanted pregnancy, ineffective coping with stressful life events, and the presence of substance abuse are accepted as risk factors that affect the development of a mother-infant relationship negatively (3,6). The literature clearly shows that prenatal attachment and smoking behavior have an inverse relationship. However, it is difficult to make a definite judgment about whether not smoking increases prenatal attachment level or whether a high prenatal attachment level increases the probability of smoking cessation. Namely, pregnant women with a high level of prenatal attachment are more likely to quit smoking (7,8), and non-smoking pregnant women have higher prenatal attachment levels (9); studies are available.

Smoking pregnancy is a serious and preventable health problem in terms of its adverse effects on maternal health and the development of healthy generations (10). According to the United States Department of Health and Human Services report, smoking during pregnancy increases the risk of stillbirths, and the babies of pregnant women who smoke are born more prematurely and at lower birth weights than the babies of non-smoker pregnant women (11). Nationwide studies on smoking rates in Turkey have reported smoking rates in pregnant women between 7.3% and 16% (12).

It was reported that the vast majority of women who were smokers reduced the number of cigarettes they smoked or intended to quit as soon as they learned about their pregnancy (13-15). The literature has emphasized that the most significant and motivating factor for women to quit smoking during pregnancy is their desire to protect their babies from the harmful effects of smoking (15,16). Mother-infant attachment levels were higher among pregnant women who planned to quit smoking (8,15). Previous studies have found that low mother-infant attachment levels are associated with unhealthy lifestyle behaviors during pregnancy (3,17). It was reported that women who stated lower levels of attachment to their babies were more likely to be smokers during their pregnancy (17). To strengthen mother-infant attachment in the pregnancy period and ensure a healthy course of this period in terms of the mother and the fetus, healthcare workers must provide support and counseling for pregnant women who do not want to quit smoking or are unable to quit despite wanting to quit.

Nurses who have the chance to spend more time with pregnant women during antenatal follow-ups and have prominent educational roles can effectively counsel pregnant women about quitting smoking. Such an effective counseling program by nurses may contribute to the strengthening of mother-infant bonding by increasing pregnant women's success in quitting smoking (18). Because smoking during pregnancy negatively affects prenatal attachment, nurses can increase mother-infant attachment levels by educating pregnant women about the harms of smoking and making interventions to quit smoking (19). In addition, nurses can increase smoking cessation rates during pregnancy by determining and improving prenatal attachment levels of pregnant women who smoke. Or, by strengthening the mother-infant bond, the effectiveness of interventions targeting both no smoking during pregnancy and cessation of smoking during pregnancy can be increased. Especially in recent years, although there are studies in the literature investigating the relationship between mother-infant attachment and many factors (such as social support status, body image, compatibility with a partner, psychosocial health, unplanned pregnancy, exposure to

violence, maternal obesity, fatigue, coping), stress, anxiety level) (1,4,20-31), and very few studies have been conducted to determine the effect of smoking during pregnancy on mother-infant attachment (8,9). In this direction, our study aimed to compare the prenatal attachment levels of smokers and non-smokers. It is thought that our study results will attract attention in terms of supporting the literature and emphasizing the importance of holistic evaluation of pregnant women, especially prenatal attachment levels and smoking status, during follow-up. The current study was carried out to compare prenatal attachment levels in smoker and non-smoker pregnant women. The research sought answers to the following questions:

1. Is there a difference between prenatal mother-infant attachment levels of smokers and non-smokers?
2. What are the nicotine addiction levels of pregnant smokers?
3. Is there a relationship between nicotine addiction levels and prenatal mother-infant attachment levels of pregnant women who smoke?
4. What is the effect of smoking during pregnancy on prenatal mother-infant attachment?

Method

Sample

This study was conducted in a comparative-descriptive design. This study was conducted in family health centers (FHCs) in a city in the Central Anatolia region of Turkey between September 2019 and June 2020. Since the prenatal attachment levels of smokers and non-smokers will be compared in the study, the G*Power 3.1.9.7 package program was used, and it was determined that at least 64 pregnant women should be in each group with 80% power, 0.5 effect size, and 95% confidence interval. Before starting the study, family physicians and family health workers serving at the FHCs were given information about the study, and pregnant women who met the inclusion criteria (273 women) were determined by interviewing the women who attended their pregnancy follow-ups at the FHCs within the specified dates using the Participant Screening Form. It was determined that among the 273 pregnant women, 108 were smokers, and 165 were not smokers. Since 28 of 108 pregnant women who were determined to smoke did not accept to participate in the study, 80 pregnant women who smoked were included in the sample (Figure 1).

The prenatal mother-infant attachment level of the pregnant women participating in the study constituted the study's dependent variable. Of the pregnant women participating in the study, age, number of pregnancies, risky pregnancy history, and smoking status of pregnant women constituted the independent variables of the study.

Criteria for inclusion in the research were between the ages of 18-35, being the first pregnancy experience, not having communication difficulties (pregnant women whose mother tongue is not Turkish), presence of mental disability, not having any mental illness diagnosed by a doctor and having a healthy fetus, being 20 weeks pregnant and over, and volunteering to participate in the research. Exclusion criteria were filling in the survey forms incompletely and having a risky pregnancy diagnosis such as eclampsia and preeclampsia, the threat of premature birth, premature rupture of membranes, and fetal distress.

Procedure

Before the study was conducted, written approval was obtained from the provincial health directorate of the family health centers where the study would be conducted, and ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee (decision no:2019/07-26). After the aim of the study was explained to the participants, informed consent was obtained from those who agreed to participate. Those who accepted to participate in the study were told that participation was voluntary and that the information to be collected would be kept confidential and used within the research scope. The study was conducted in accordance with the Principles of the Helsinki Declaration.

For comparison, 80 non-smoking pregnant women were selected among 165 non-smoking pregnant women using a simple random numbers table and included in the study. Then, Personal Information Form, Fagerstrom Test for Nicotine Dependence (FTND), and Prenatal Attachment Inventory (PAI) forms were applied face to face in a suitable interview room in family health centers to a total of 160 pregnant women (80 smokers and 80 non-smokers) included in the sample. Filling out the forms took approximately 15 minutes for non-smoking pregnant women and 20-25 minutes for smokers.

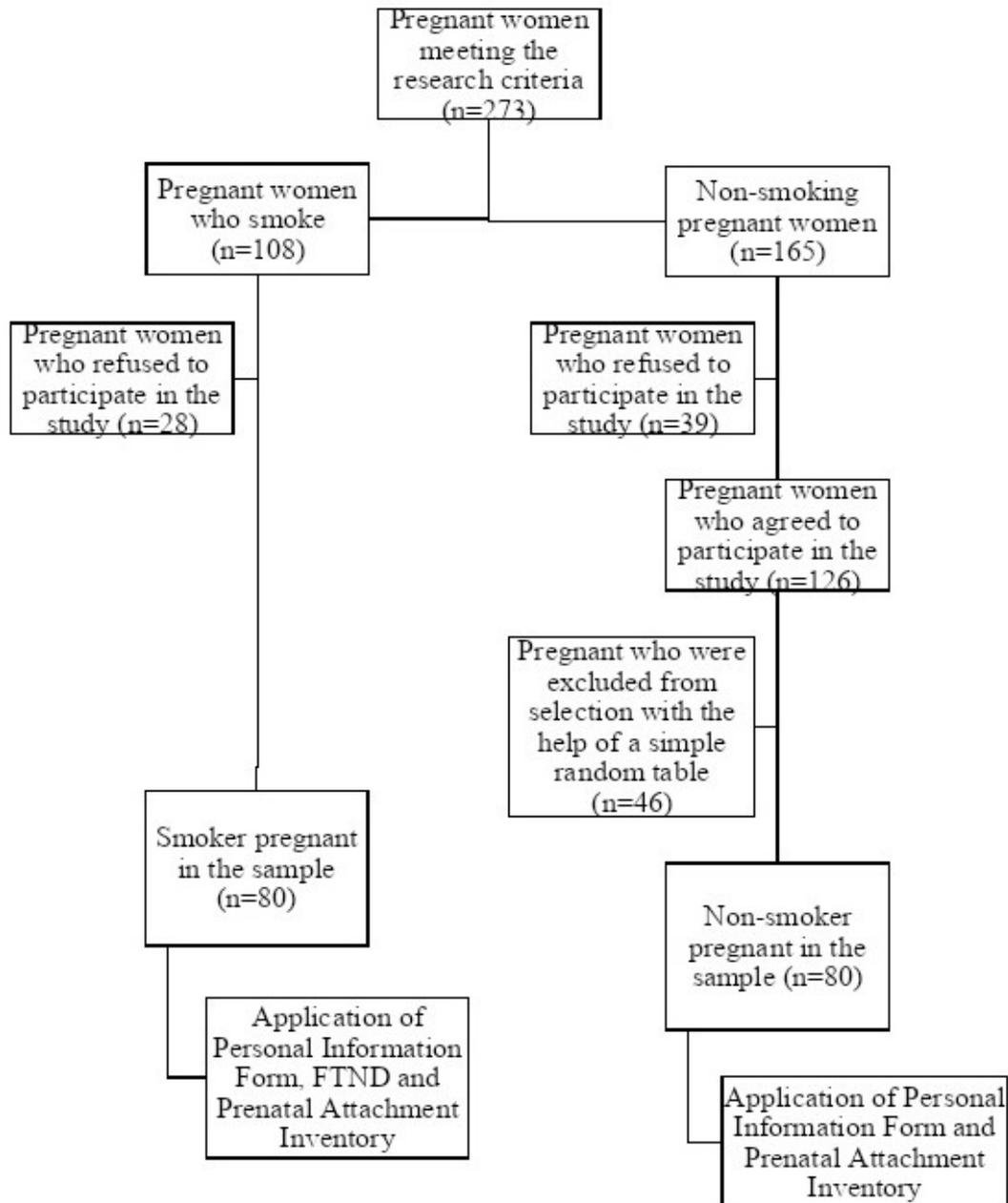


Figure 1. Flow chart of study

Measures

The data were collected using the Participant Screening Form, the Personal Information Form, the FTND, and PAI.

Participant Screening Form

The form that the researcher prepared based on information in the literature (8,30) included seven questions for collecting information on the status of the pregnant women to meet the inclusion criteria (being in the age group of 18-35, having one's first pregnancy, not having communication difficulties or mental deficiencies, not having any chronic health problem, having a healthy fetus and being in as least the 20th week of pregnancy) and 1 question on the smoking statuses of the pregnant women.

Personal Information Form

The form the researcher prepared based on information in the literature (4,8) consisted of two parts and 24 questions. The first part of the form; consisted of 16 questions, including the sociodemographic characteristics of pregnant women. In the second part of the form, There were eight questions to determine pregnant individuals' smoking attitudes and behaviors.

Fagerstrom Test for Nicotine Dependence (FTND)

In the study, the Turkish version of the "Fagerstrom Test for Nicotine Dependence" was utilized to measure the nicotine dependence levels of pregnant women who were smokers. Fagerstrom and Schneider developed FTND to determine the level of physical dependence on smoking (32). FTND has six items, each with response options from 0 to 3. According to the total score of this test, nicotine addiction levels are categorized as very low (0-2 points), low (3-4 points), moderate (5 points), high (6-7 points), and very high (8-10 points). The Cronbach's alpha internal consistency coefficient of the form of the scale that was adapted to Turkish and tested for reliability by Uysal et al. was reported as 0.56 (33). In this study, Cronbach's alpha coefficient of FTND was calculated as 0.73.

Prenatal Attachment Inventory (PAI)

The PAI was developed by Mary Muller in 1990. The scale, validated by Yilmaz and Beji by adapting into Turkish in 2013, consists of 21 items questioning the thoughts, feelings, and events that women experience during pregnancy and determining their levels of attachment to the baby in the prenatal period. Each item is scored on a four-point Likert-type scale ranging between 1 and 4 points. The scale's minimum and maximum possible scores are 21 and 84, respectively. The higher the score is, the higher the woman's level of attachment is. In the study of Yilmaz and Beji, Cronbach's alpha value was determined as 0.84 (34). The Cronbach's alpha value was 0.92 in the present study.

Statistical Analysis

The data obtained for the study were entered into the SPSS 23.0 program. Descriptive statistics (mean, standard deviation, minimum and maximum values, and percentages), chi-square test, ANOVA, and t-test were used to analyze the data. Whether the data were normally distributed or not was determined by the Kolmogorov-Smirnov (K-S) test, and it was determined that the data showed normal distribution. Pearson correlation analysis was used to determine the direction and strength of the relationships between the variables since the data fit the normal distribution. The correlation strength is the correlation value (r) calculated between the two variables; $r=0.0$ no relationship, $r=0.01-0.29$ low correlation, $r=0.30-0.70$ moderate relationship, $r=0.71-0.99$ high correlation, $r= 1.0$ indicates perfect relationship (35). Differences between groups were examined using the Tukey post hoc test. The odds ratio was calculated to determine the level of relationship between prenatal attachment and smoking status, and binary logistic regression analysis was performed to determine the effect of smoking on prenatal attachment. The smoking status of pregnant women was included as a parameter in the regression analysis. Model validity was determined according to the Omnibus, Hosmer, and Lemeshow tests, and the model was compatible. Omnibus, Hosmer, and Lemeshow tests were performed to evaluate the suitability of logistic regression analysis (Omnibus test $p<0.05$; Hosmer Lemeshow test $p>0.05$). Linear Regression Analysis was performed to determine the effect of nicotine addiction of pregnant smokers on prenatal mother-infant attachment scores. The significance level for all tests was 0.05, and the confidence intervals were calculated as 95%.

Table 1. Some descriptive characteristics of pregnant smokers and non-smokers (n=160)

Variable	Pregnant Who Smoke (n=80)		Non-Smoking Pregnant Women (n=80)		Test value and p value
	n	%	n	%	
Age X±SD (min- maks)]	25.40 ±4.68 (18-41)		25.01 ±4.24 (18-42)		t=0.345* p=0.618
Age					$\chi^2= 0.510^{**}p=0.775$
18-22 age	21	26.3	22	27.5	
23-27 age	35	43.7	38	47.5	
28-35 age	24	30.0	20	25.0	
Education level					$\chi^2= 3.134^{**}p=0.209$
Primary education	28	35.0	39	48.8	
Secondary education	27	33.8	22	27.4	
Undergraduate education	25	31.2	19	23.8	
Working status					$\chi^2= 0.108^{**}p=0.742$
Working	30	37.5	28	35.0	
Not working	50	62.5	52	65.0	
Perception of the economic situation					$\chi^2= 1.958^{**} p=0.376$
Income less than expenses	16	20.0	22	27.5	
Income equals expense	49	61.3	48	60.0	
Income more than expenses	15	18.7	10	12.5	
Family type					$\chi^2=3.609^{**}p=0.2.852$
Nuclear family	62	77.5	71	88.8	
Extended family	18	22.5	9	11.2	
Obstetrics Features					$\chi^2=1.053^{**}p=0.305$
How to conceive					
Untreated pregnancy	63	78.8	68	85.0	
Pregnancy with treatment	17	21.2	12	15.0	
Gestational week					$\chi^2=3.609^{**} =0.057$
2nd trimester	48	60.0	36	45.0	
3rd trimester	32	40.0	44	55.0	
Pregnancy planning status					$\chi^2=0.413^{**} =0.521$
Yes	49	61.3	45	56.2	
No	31	38.7	35	43.8	
State of desiring pregnancy					$\chi^2=0.001^{**} =0.998$
Yes	70	87.5	70	87.5	
No	10	12.5	10	12.5	

*t test, **the chi-square test, p<0.05

Results

The mean ages of smokers and non-smokers pregnant women were 25.40 (SD 4.68) and 25.01 (SD 4.24), respectively. When the sociodemographic and obstetric characteristics of smokers and non-smokers were compared, There was no significant difference between the groups in terms of age, education level, employment status, monthly income, family type, mode of conception, gestational week, and pregnancy

planning status ($p>0.05$) (Table 1). The mean FTND score of the smoker participants was 2.82 ± 2.64 , while 73.7% had low or very low levels of nicotine dependence (Table 2).

Table 2. Smoking habit characteristics of pregnant smokers, Fagerstrom Test for Nicotine Dependence (FTND) score and nicotine dependence levels (n=80)

Features of Smoking Habit	Pregnant who smoke	
	n	%
Age of Initiation of Smoking [$X\pm SD$ (min- maks)]= 19.26 ± 3.79 (11-34)		
15 years and under	15	18.8
16-18 years old	21	26.2
19 age and over	44	55.0
Daily Amount of Smoking		
0-4 cigarettes	57	71.2
5-10 cigarettes	8	10.0
11-20 cigarettes	15	18.8
Smoking Time [$X\pm SD$ (min- maks)]= 6.51 ± 5.03 (1-18)		
1-5 years	18	22.5
6-10 years	30	37.5
10 years and above	32	40.0
FTND Total Score Average [$X\pm SD$ (min- maks)]= 2.82 ± 2.64 (Min:0; Max:10)		
Addiction Level		
Very high addiction (8-10 points)	7	8.8
High addiction (6-7 points)	8	10.0
Moderately addictive (5 points)	6	7.5
Low addiction (3-4 points)	18	22.5
Very low addiction (0-2 points)	41	51.2

* Percentages are calculated over numbers.

Table 3. Relationship between Fagerstrom Test for Nicotine Dependence and Prenatal Attachment Inventory scores of pregnant smokers

	Prenatal Attachment Inventory (PAI)		
	n	r^a	p
Fagerstrom Test for Nicotine Dependence (FTND) Mean: 2.82 ± 2.64 (Min:0; Max:10)	80	-0.439	0.001*

^aPearson correlation analysis applied, * $p<0.001$.

Table 4. Prenatal Attachment Inventory (PAI) mean scores of smoker and non-smoker pregnant

n=160	PAI Total			
	$X\pm SD^a$	Min.-Max.		
	53.26 ± 13.10	24-80		
Smoking Status (Groups)	PAI Total		t^b	p
	$X.\pm SD^a$	Min.-Max.		
Smoker in Pregnancy (n=80)	52.82 ± 12.83	24-72	-0.409	0.683
Non-Smoker During Pregnancy (n=80)	53.68 ± 13.43	32-80		

^aStandard deviation. ^bThe t-test, $p<0.05$

There was a negative, moderate, and significant relationship between the mean total FTND scores of the smoker participants and their mean total PAI scores ($r=-0.439$; $p=0.001$), where, as the nicotine

dependence levels of these participants increased, their prenatal mother-infant attachment levels decreased (Table 3).

The mean total PAI score was 52.82 ± 12.83 for the smoker participants and 53.68 ± 13.43 for the non-smoker participants. The mean total PAI score of the non-smoker participants was higher than that of the smoker participants, but the difference was not statistically significant ($p > 0.05$) (Table 4).

Table 5. Effect of smoking and nicotine dependence on prenatal attachment

Effect of Smoking on Prenatal Attachment*	B	S.E.	Wald	df	p	(OR)	95% CI Exp(B)	
							Low	Top
Smoking	-4.631	2962,25	22.340	1	0.999	0.010	0.965	0.985
Effect of Nicotine Dependence on Prenatal Attachment		B	S.E.	Beta		t	p	
FTND Total		-2.129	0.493	0.439		-4.315	0.001	
R=0.439 R ² =0.193 F _(1,78) =18.619 p=0.000								

S.E: Standard Error, DF Degrees of Freedom, CI: Confidence Interval; * Logistic Regression, Omnibus, Hosmer and Lemeshow tests ** Linear Regression, $p < 0.05$; OR: Odds ratio

Bivariate logistic regression analysis revealed that the effect of smoking during pregnancy on prenatal mother-infant attachment (Odds Ratio=0.010; $p=0.999$) was insignificant ($p > 0.05$) (Table 5). According to the results of linear regression analysis, nicotine addiction of pregnant smokers participating in the study had a significant negative effect on prenatal mother-infant attachment scores; therefore, it was determined that nicotine addiction during pregnancy was one of the factors affecting the decrease in prenatal mother-infant attachment by 19.3%, and nicotine addiction during pregnancy significantly reduced prenatal mother-infant attachment by -2.129 times ($p < 0.05$) (Table 5).

In the analyses of the mean PAI scores based on the sociodemographic characteristics of the participants, it was revealed for both the smoker and non-smoker groups that the mean PAI score of the participants who had higher income than their expenses was significantly higher than those who had lower income than their expenses. In contrast, the participants with nuclear families had a significantly higher mean PAI score than those with extended families ($p < 0.05$). While prenatal attachment increased as age increased in the smoker group, there was no significant relationship between prenatal attachment and age in the non-smoker group. There was also no significant relationship between the participants' education levels and mean PAI scores (Table 6).

Table 6. Prenatal Attachment Inventory (PAI) mean scores according to some characteristics of pregnant smokers and non-smokers (n=160)

Sociodemographic Characteristics	Pregnant women who smoke (n=80)	Test and p value	Non-smoking pregnant women (n=80)	Test and p value
	X ± SE		X ± SE	
Age				
18-22 age ^a	51.23±12.93	F=0.572* p=0.012 c>a**	52.77±13.34	F=0.767* p=0.466
23-27 age ^b	51.71±14.15		54.70±14.31	
28-35 age ^c	55.87±10.49		52.70±12.25	
Education level				
Primary education	54.53±12.84	F=0.832* p=0.545	52.83±13.88	F=0.928* p=0.397
Secondary education	52.51±12.92		52.68±12.54	
Undergraduate education	51.28±13.03		54.57±13.78	
Perception economic situation				
Income less than expenses ^a	48.87±11.06 ^a	F=6.264*	48.90±13.02 ^a	F=4.925*

Income equals expense ^b	53.34±13.11 ^b	p=0.002	54.14±13.04 ^b	p=0.008
Income more than expenses ^c	55.40±13.51 ^c	c>a**	62.90±11.71 ^c	c>a**
Family Type				
Nuclear family	53.33±13.47	t=4.572***	55.12±13.24	t=6.906***
Extended family	51.11±10.49	p=0.038	42.33±9.09	p=0.009
Obstetrics Features				
Prenatal Follow-up Frequency				
4 times or less	44.02±13.51	t=4.234***	47.28±10.16	t=6.674***
5 times or more	55.16±12.41	p=0.012	60.32±12.38	p=0.003
Gestational Week				
2nd trimester (20-24. week)	52.29±12.42	t=6.236***	48.05±10.72	t=4.762***
3rd trimester (25-40. week)	53.65±13.58	p=0.524	58.29±13.76	p=0.031
Baby's Gender				
Known	53.68±13.09	t=0.384***	54.63±13.87	t=0.245***
Unknown	51.02±12.34	p=0.664	49.60±10.75	p=0.621
Spouse's Response to Pregnancy		t=23.340***		t=35.670***
Positive response	53.53±12.03	p=0.000	56.61±13.06	p=0.000
Neutral response	41.13±9.31		42.82±8.36	
Pregnancy Planning Status				
Yes	57.10±11.18	t=16.452***	57.53±12.93	t=25.203***
No	46.09±12.52	p=0.000	48.74±12.56	p=0.000
State of Desiring Pregnancy				
Yes	54.22±11.60	t=18.435***	55.31±13.16	t=31.225***
No	36.10±7.63	p=0.000	42.30±9.45	p=0.000
Support in Baby Care				
None	48.29±12.56	t=6.226	50.29±13.37	t=7.114
There is	55.15±12.45	p=0.004***	55.14±13.37	p=0.008***

*Comparisons between groups were made with two-way ANOVA analysis of variance. **Tukey test, ***t test, p<0.05

When comparing the mean PAI scores of smokers and non-smokers according to their obstetric characteristics, it was found that the mean PAI scores of those who had five or more prenatal follow-ups were significantly higher than those who had four or fewer prenatal follow-ups for both groups. The mean PAI score was lower in those with unwanted and unplanned pregnancies than in those who wanted and planned their pregnancy ($p<0.05$). While the mean prenatal attachment score of those in the third trimester in the non-smoker group was higher than those in the second trimester, no significant relationship was found between trimesters of pregnancy and prenatal attachment in the smoking group (Table 6).

Discussion

In this study, the mean total PAI score of the non-smoker participants (53.68 ± 13.43) was higher than that of the smoker participants (52.82 ± 12.83). However, this difference was not statistically significant ($p>0.05$). Bivariate logistic regression analysis revealed that the effect of smoking during pregnancy on prenatal mother-infant attachment (Odds Ratio=0.010; $p=0.999$) was insignificant ($p>0.05$). Similar to the result of our study, Jussila et al. reported no significant relationship between prenatal smoking status and mean total PAI scores (8). In a study, although there was no significant difference between smoking and prenatal attachment, it was found that prenatal attachment levels were higher in pregnant women who had quit smoking than in pregnant women who smoked (15). The results of our study and many others were compatible with the literature showing that women who adopt unhealthy lifestyle behaviors and those who

smoke have weaker prenatal attachments (3,15). Strengthening prenatal attachment may constitute a promising new approach to interventions for smoking cessation during pregnancy. Another study found a positive and significant relationship between health practices during pregnancy and mother-baby attachment (36). In another study, low maternal-fetal attachment was associated with more pregnancy-related smoking (37). Another study found that women who think about their baby's health and have higher attachment scores are more likely to quit smoking during pregnancy (15). It was determined that as the prenatal attachment levels of pregnant women increased, their participation in health practices during pregnancy increased (38). The mean prenatal attachment scores of non-smoking pregnant women were found to be higher than those of smokers (9). Strengthening the mother's bond with her baby and determining the factors affecting attachment behaviors are extremely important in raising healthy generations. In our study, it was thought that the insignificance of the difference between prenatal attachment levels of smokers and non-smokers might be due to the low or very low level of nicotine addiction in most of the pregnant women who smoke. For this reason, conducting comprehensive studies by taking samples from pregnant women with high nicotine addiction may be recommended to evaluate the relationship between smoking and prenatal mother-infant attachment.

The present study determined that as the level of nicotine dependence increased in pregnant women who smoked, prenatal mother-infant attachment decreased. The literature has determined that strong mother-baby attachment is effective in keeping pregnant women away from harmful substances and adopting healthy behaviors (3,4). In two separate studies, different from the results of our study, it was found that there was no significant relationship between the FTND and PAI scores of pregnant women who smoked (8,9). In other studies, it was found that prenatal attachment levels were lower in pregnant women who smoked and had high nicotine addiction, in line with our findings (15,17). Our study and most literature findings reveal that smoking and nicotine addiction negatively affect prenatal attachment.

In this study, it was seen that as the age of the smoker pregnant women increased, their prenatal attachment levels increased. At the same time, there was no significant relationship between the variable of age and prenatal attachment in the non-smoker group. There was no statistically significant difference in the mean PAI scores of the pregnant women in our study based on their educational levels ($p>0.05$). Our finding was supported by the higher prenatal attachment levels reported by Aslantekin-Ozcoban et al. in pregnant women who were smokers and over 30 and by Ozdemir et al. in pregnant women over 30 (9,28). In contrast to these findings, many studies conducted with pregnant women have reported lower levels of prenatal attachment as the age of women increases (4,22,29,39). Another study found no significant relationship between maternal age and PAI score (6). Elkin stated that age, educational level, and family type did not significantly affect prenatal attachment (6). While some studies found that as the mother's educational level increases, her PAI score increases (4,22,25,40), other studies have found no significant difference between these two variables (1,6). A study determined that as the education level increased, prenatal attachment decreased significantly (41). The reason for the differences in reports in the literature regarding the relationship between PAI scores and the variables of age and educational level may be that in addition to age and education-related characteristics, cultural and environmental factors influence pregnant women's prenatal attachment levels.

In this study, it was seen among both the smoker and non-smoker pregnant women that the participants who had wanted and planned pregnancies had a higher mean PAI score than those who had unwanted and unplanned pregnancies ($p<0.05$). In agreement with our result, Aslantekin-Ozcoban et al. reported higher levels of prenatal attachment among both smoker and non-smoker pregnant women who had planned their pregnancy (9). Contrary to our findings, Ozdemir et al. reported lower prenatal attachment levels among women planning pregnancy (28). Several other studies have revealed that pregnant women experiencing wanted and planned pregnancies have higher levels of prenatal attachment (4,21,22,38,42). Independently of smoking habits, a planned pregnancy is expected to affect prenatal attachment positively. It is predicted that wanting to become pregnant and getting pregnant at the desired time will facilitate the adaptation of the pregnant to motherhood, thus increasing the attachment to the baby. Contrary to this study and the results generally reported in the literature, there are also studies reporting no significant relationship between

the planning status of pregnancies and PAI scores (1,6,24). Differences in findings in different studies may be due to the different demographic and obstetric characteristics of the women included in these studies that would affect their prenatal attachment levels or the cultural environment in which they lived.

In this study, the mean prenatal attachment scores of the non-smokers in the third trimester were significantly higher than those in the second trimester ($p < 0.05$). However, there was no significant relationship between them. Similarly, Küçükkaya et al. found the mean PAI scores of pregnant women in the third trimester higher than those in the first or second trimester (25). These findings suggest that as the weeks of pregnancy progress and fetal movements increase, the possibility of experiencing maternal feelings more intensely and establishing a stronger bond with her baby increases. In addition, this finding was thought to be related to the higher prenatal attachment levels of the non-smoker group compared to the smokers' group. Contrary to our findings, in two different studies, prenatal attachment levels of pregnant women in the last trimester were lower than those in other trimesters (43,44). Some studies found no significant relationship between gestational week and mean PAI scores (20,22). The finding in the literature that attachment levels are lower in the last three months of pregnancy may be associated with the fact that women focus on themselves rather than their babies because of the fear and anxiety they may experience about the upcoming birth process. In our study, there was no relationship between the trimesters and prenatal attachment levels of the smoking participants ($p > 0.05$). The lack of a significant relationship between attachment in the last weeks of pregnancy and trimesters in pregnant women can be explained by the lower prenatal attachment levels compared to non-smoking pregnant women.

In our study, the average PAI score of pregnant women whose income is more than their expenses and the PAI score averages of those with a nuclear family were significantly higher than those with a large family with a lower income than their expenses. ($p < 0.05$). In parallel with our results, Öztürk and Erbaş found that prenatal attachment levels were higher in pregnant women with good income and the nuclear family (29). Some studies have reported that attachment levels are significantly higher in pregnant women with better incomes (24,25). Erkal-Aksoy et al. found no significant difference in the average PAI scores according to the income level variable (1). Bakır and Sarıayım reported that attachment levels are higher in pregnant women with nuclear families and low-income levels (21). The difference in the reports in the literature on the relationship between income level and prenatal attachment may be related to the relative income perception of individuals. Our result that prenatal attachment levels are higher in pregnant women with nuclear families was similar to the results in the literature. This finding can be interpreted as women living in nuclear families can find the opportunity to spare more time for themselves and their unborn babies during pregnancy than those living in extended families.

The data of this study are limited to pregnant women admitted to FHCs included between September 2019 and June 2020 for pregnancy follow-up. Another limitation of this study is that the smoking status of the pregnant women included in the sample was recorded according to their reports, and biochemical confirmation was not performed. Another limitation of the study is the low cigarette addiction among smokers. Therefore the effect of cigarette addiction is not strong in comparing prenatal attachment levels of smokers and non-smokers.

In conclusion, in this study, it was determined that smoking status during pregnancy did not significantly affect the prenatal attachment levels of pregnant women. However, a negative relationship existed between nicotine addiction levels and prenatal attachment levels of pregnant women who smoked. The study found that the mean prenatal attachment score was higher in pregnant women with a higher income than their expenses, had a nuclear family, and became pregnant voluntarily and planned among pregnant women who smoked and non-smokers. It was found that the mean attachment scores increased. Considering that smoking is one of the factors that negatively affect prenatal mother-infant attachment, primary healthcare institutions should evaluate women's smoking status and nicotine addiction levels, especially before pregnancy planning, in order to strengthen prenatal attachment and create a healthy bond between mother and baby, and to reduce smoking starting from the pre-pregnancy period. They should provide cessation counseling. In addition, approaches to increase prenatal attachment levels of smoking pregnant women

should be included in smoking cessation counseling programs. In conclusion, strengthening prenatal attachment in pregnant women may be a promising approach to increase the chances of success in quitting smoking.

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